Electron induced fragmentation of sulphur containing biological prototypes: thiaproline and taurine

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Synopsis Here we present negative ion formation driven by electron transfer in atom (potassium) molecule collision and dissociative electron attachment in sulphur containing compounds, probing the influence of sulphur atoms in the decomposition mechanism of two biological relevant molecules: thiaproline and taurine.

Sulphur containing nucleobases have been suggested as anticancer drugs.[1] Secondary electrons produced in the biological environment, as a result of the primary radiation interaction, may efficiently enhanced DNA/RNA loss of integrity. Such electron-induced decomposition mechanisms have been recognized on the basis of temporary molecular anions formation. However, there is still scarce information in the literature on the interaction of low-energy electrons with sulphur containing biologicaly relevant molecules. Notwithstanding, electron transfer has been acknowledge to be more attuned to the physiological environment processes in the decomposition of key molecular structures in several DNA/RNA constituents and other biological relevant molecules.[2, 3, 4]

Here we address electron capture and electron transfer induced decomposition of two sulphur containing biological prototypes, 4-thiaproline and taurine, the former a relevant amino acid with a key role in the human physiology and the latter suggested as a possible anti-cancer drug. [5]

In the electron transfer process by atom(potassium)-molecule collision experiments, a transient negative ion is formed, with the excess internal energy channelled into the different degrees of freedom resulting therefore in fragmentation. The resulting anionic fragments are time-of-flight (TOF) mass analysed. Moreover, dissociative electron attachment studies to sulphur containing molecules, such as taurine and 4-thiaproline are presented and compared with electron transfer studies upon potassium collisions

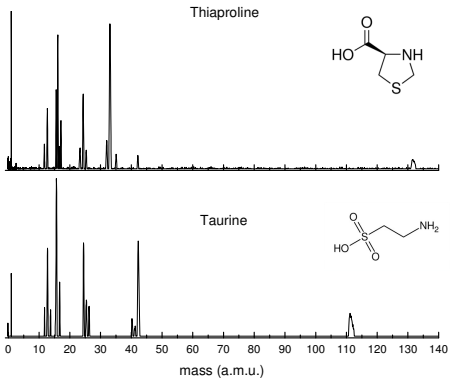

Figure 1. Anion mass spectra for 100 eV potassium impact on 4-thiaproline and taurine.

References

[1] G. B. Elion 1989 *Science* **244** 4900

[2] F Ferreira da Silva *at al* 2012 *Eur. Phys. J. D* **66** 78

[3] D. Almeida *at al* 2011 *PCCP* **13** 15657

[4] D. Almeida *at al* 2013 *PRL* **110** 023201

[5] M. Suo *at al* 2006 *Cancer letters* **237** 2

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